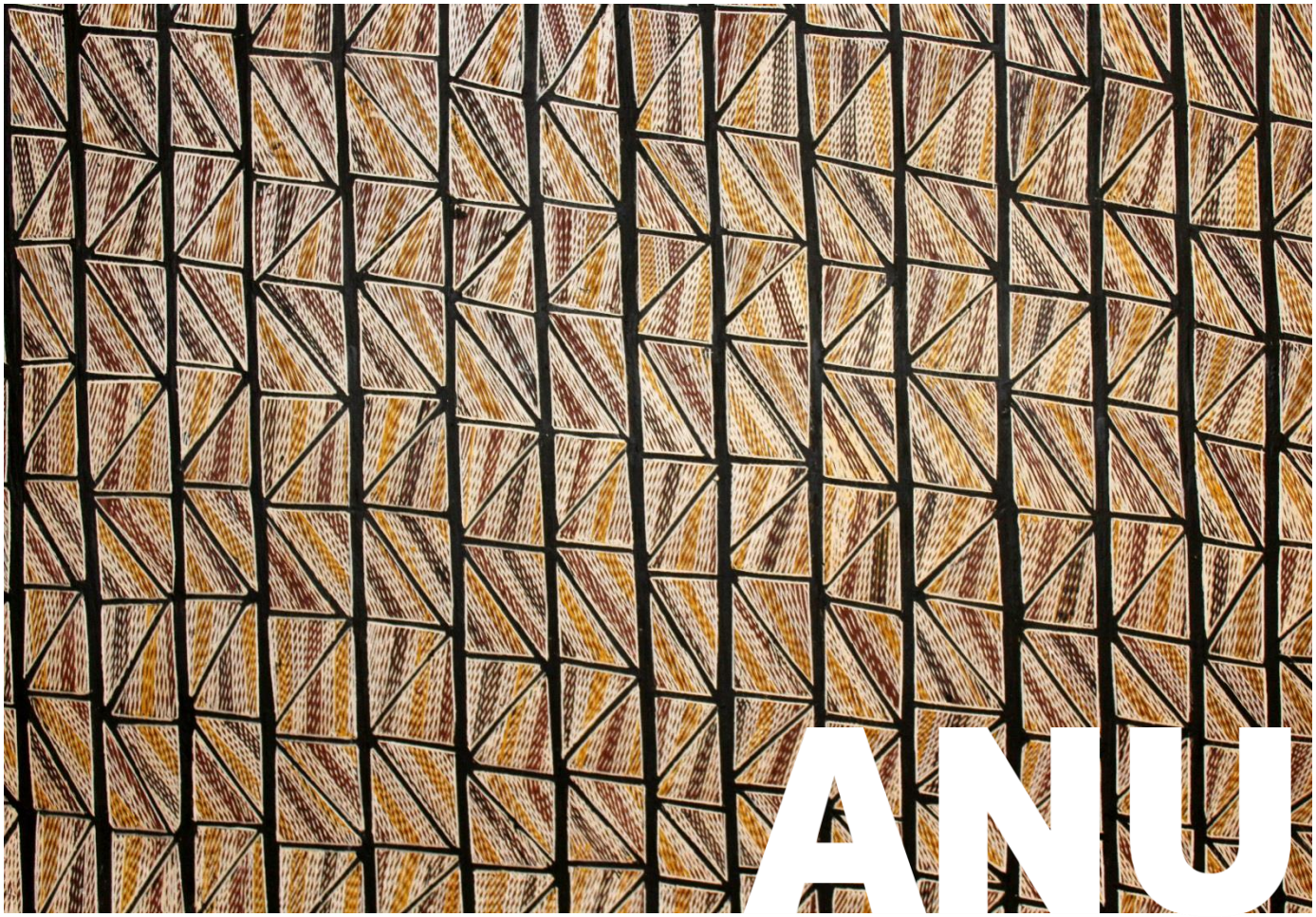
Australian National University



AREA LEVEL SOCIOECONOMIC OUTCOMES FOR ABORIGINAL AND TORRES STRAIT ISLANDER AUSTRALIANS IN THE 2016 AND 2021 CENSUSES

N. BIDDLE AND F. MARKHAM

Centre for Aboriginal Economic Policy Research
ANU College of Arts & Social Sciences

CAEPR WORKING PAPER NO. 144/2023

Series note

The Centre for Aboriginal Economic Policy Research (CAEPR) undertakes high-quality, independent research to further the social and economic development and empowerment of Indigenous people throughout Australia.

For more than 30 years, CAEPR has aimed to combine academic and teaching excellence on Indigenous economic and social development and public policy with realism, objectivity and relevance.

CAEPR maintains a substantial publications program, including Research Monographs, Discussion Papers, Working Papers and Topical Issues.

The CAEPR Working Paper series exists to disseminate preliminary research findings, to share ideas about a topic, or to elicit discussion and feedback. All Working Papers are subject to internal peer review.

All CAEPR publications are available in electronic format for free download from CAEPR's website:

https://caepr.cass.anu.edu.au

CAEPR is located within the Research School of Social Sciences in the College of Arts & Social Sciences at the Australian National University (ANU). The Centre is funded from a range of sources, including ANU, the Australian Research Council, industry and philanthropic partners, and Australian state and territory governments.

As with all CAEPR publications, the views expressed in this Working Paper are those of the author(s) and do not reflect any official CAEPR position.

Professor Valerie Cooms
Director, CAEPR
Research School of Social Sciences
College of Arts & Social Sciences
The Australian National University
October 2023

Working Paper No. 144/2023

DOI 10.25911/DY8M-S345
ISSN 1442-3871
ISBN 978-1-925286-65-6

For a complete list of CAEPR publications, see https://caepr.cass.anu.edu.au/research/publications

Centre for Aboriginal Economic Policy Research
Research School of Social Sciences
College of Arts & Social Sciences
The Australian National University

Front cover image:
Terry Ngamandarra Wilson, Gulach (detail), painting on bark, private collection © Terry Ngamandarra, licensed by Viscopy, 2016

Suggested citation:
Biddle, N. & Markham, F. (2023), *Area-level socioeconomic outcomes for Aboriginal and Torres Strait Islander Australians in the 2016 and 2021 Censuses* (Working Paper No.144/2023), Centre for Aboriginal Economic Policy Research, Australian National University.
https://doi.org/10.25911/DY8M-S345

Nicholas Biddle is a Professor at the Centre for Social Research and Methods (CSRM), Research School of Social Sciences (RSSS), College of Arts & Social Sciences, Australian National University. **Francis Markham** is a Research Fellow at the Centre for Aboriginal Economic Policy Research (CAEPR), RSSS.

Area-level socioeconomic outcomes for Aboriginal and Torres Strait Islander Australians in the 2016 and 2021 Censuses

N. Biddle and F. Markham

Abstract

Since the 2001 Census, the Centre for Aboriginal Economic Policy Research (CAEPR) has developed the Indigenous Relative Socioeconomic Outcomes (IRSEO) index to assist Indigenous communities and organisations in advocating for resource allocation based on relative needs, and assist governments in directing services toward areas with the most significant impact on Indigenous populations. This study replicates previous analyses using data from the 2021 Census.

After describing the 2021 IRSEO index, this paper expands on previous analysis in four ways. First, it examines the ongoing need for an index of socioeconomic outcomes that is specific to the Indigenous population. Second, it examines changes in relative Indigenous socioeconomic outcomes over time, asking which sorts of places have become relatively more advantaged and which relatively less advantaged. Third, it investigates the validity of a new census question about long-term health conditions for the Indigenous population, and investigates whether it provides a useful measure of Indigenous health outcomes to include in the IRSEO index. And fourth, it examines the potential impact of COVID-19 restrictions on the Indigenous relative socioeconomic outcomes recorded in the 2021 Census.

Our findings indicate that spatial inequalities in Indigenous socioeconomic outcomes have widened from 2016 to 2021, with regional areas experiencing more rapid improvements compared to other urban or remote locations. Conversely, outcomes in remote Indigenous towns and locations in the Northern Territory have further declined relative to the rest of the country. Despite the 2021 Census occurring amidst heightened COVID-19 governmental interventions, the impact on relative Indigenous socioeconomic outcomes appears to be minimal. We also find that newly introduced health-related questions in the census exhibit limited internal validity for evaluating Indigenous health outcomes. Accordingly, they have been excluded from the IRSEO index.

The 2021 IRSEO index, as detailed in this article, can be accessed and downloaded from the CAEPR website.

Acknowledgments

The authors wish to thank two referees for their helpful and constructive comments, and Hilary Bek for her assiduous copyediting.

Acronyms

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ANU	Australian National University
ASGS	Australian Statistical Geography Standard
CAEPR	Centre for Aboriginal Economic Policy Research
CATSIPO	Coalition of Aboriginal and Torres Strait Islander Peak Organisations
CSRM	Centre for Social Research and Methods
IARE	Indigenous Area
IRSAD	Index of Relative Socio-Economic Advantage and Disadvantage
IRSD	Index of Relative Socio-Economic Disadvantage
IRSEO	Indigenous Relative Socio-Economic Outcomes (Index)
NSW	New South Wales
PCA	principal components analysis
PINIRSEO	Pooled Indigenous and non-Indigenous Relative Socioeconomic Outcomes (Index)
SEIFA	Socio-Economic Indices for Areas
SA1	Statistical Area 1

Contents

Tables

Figures

Introduction

With the release of Australia's 2021 Census of Population and Housing, there is considerable interest in understanding change in the Aboriginal and Torres Strait Islander population. Between the 2016 and 2021 Censuses, there was a very rapid growth in the number of people who identified as being Aboriginal or Torres Strait Islander. While there was still a substantial undercount of Indigenous people (Andrews & Markham, 2022; Harding et al., 2021), there were 812 728 respondents who identified or were identified as being 'of Aboriginal and Torres Strait Islander origin', an increase of 25.2% from the 2016 Census. This was a much faster growth than for the total Australian census count (in part because of net outward migration due to COVID-19 restrictions), which meant that of those who had their Indigenous status recorded in the particular years, there was an increase in the share of the population who were identified as being Indigenous, from 2.95% in the 2016 Census to 3.36% in the 2021 Census.

The census serves as an invaluable source of comprehensive information, unattainable through other means, and offers a consistency in methodology that allows for a careful comparison of change through time across a number of domains. A primary objective of the Australian census is to collect precise data on Aboriginal and Torres Strait Islander people in Australia. Owing to their relatively small population size, large datasets, such as the census, are indispensable in obtaining measures of variability in outcomes for Aboriginal and Torres Strait Islander people based on demographic or geographic characteristics. National surveys, in contrast, are unable to provide the same level of geographical or demographic detail as the census.

One application of census data is to enhance our understanding of the evolving spatial distribution of Indigenous socioeconomic outcomes. Recognising the significance of understanding this spatial distribution, the Coalition of Aboriginal and Torres Strait Islander Peak Organisations (CATSIPO) and all Australian Governments incorporated it into the 2020 National Agreement on Closing the Gap (CATSIPO & Australian Governments, 2020). This agreement is the first to be negotiated with peak bodies representing First Nations community-controlled organisations (Anderson, 2021; Dillon, 2021). A novel aspect of this agreement is the commitment to monitor socioeconomic outcomes at fine geographical scales. The inclusion of geographical disaggregation in this new framework is intended to facilitate the identification of 'areas demonstrating progress and those requiring greater effort' (CATSIPO & Australian Governments, 2020, p. 21). The new agreement specifies that progress reporting on the socioeconomic targets must be disaggregated. Of the 17 targets reported, 16 are to be disaggregated by state/territory, 15 by remoteness, 13 by the socioeconomic status of the area, and 6 by other geographical categories (CATSIPO & Australian Governments, 2020).

While Closing the Gap reporting geographically disaggregates results for numerous outcome areas, this reporting method evaluates each indicator individually rather than collectively. Many of the outcomes to be monitored under the National Agreement on Closing the Gap are closely related and influence individuals' life chances cumulatively. For instance, lower levels of education often correlate with reduced income levels and access to stable and suitable housing (Biddle, 2009). Consequently, it may be beneficial to amalgamate data on multiple outcomes that are related to each other into a singular indicator or index, enabling holistic comparisons across areas. This has the additional benefit of simplicity when it comes to targeting of interventions, as long as the underlying measures are empirically and conceptually similar enough to each other.

Factorial ecology is a well-established spatial statistical approach that is suitable for describing area-level data when multiple outcomes measures are of interest. Developed by economic geographers in the 1950s (Johnston, 1971), factorial ecology aims to analyse and describe the relationships between socioeconomic factors and their spatial distribution. Employing multivariate statistical techniques, factorial ecology seeks to identify patterns and structures within and across cities and regions. When examining factors such as income, occupation, and education, factorial ecology contributes to the understanding of socio-spatial economic inequalities.

In interpreting the results of such investigations, it is important to understand that spatial patterns of advantage and disadvantage do not reflect the innate characteristics of people or places (Slater, 2013). If the life chances of individuals are spatially patterned, it is important to understand why these geographical inequalities exist and are reproduced over time. A descriptive analysis of the spatial patterning of socioeconomic inequalities can provide useful data to inform an understanding of the historical, structural and institutional arrangements driving and sustaining spatial patterns of poverty and inequality today.

This study undertakes such an analysis. Making use of the newly available 2021 Census data, this study presents the findings of an index of area-level socioeconomic outcomes for Aboriginal and Torres Strait Islander people in Australia, using 2021 Census data. In addition, it has the following aims:

1. To investigate whether there continues to be a need for an Indigenous-specific index, or whether the Socio-Economic Indices for Areas (SEIFA) indices produced by the Australian Bureau of Statistics (ABS) for the entire Australian population provide a suitable proxy for Indigenous socioeconomic outcomes.
2. To examine whether or not regional inequalities in Indigenous socioeconomic outcomes are narrowing or widening.
3. To compare socioeconomic outcomes between Indigenous and non-Indigenous Australians at the area level.
4. To investigate which areas saw changes in relative Indigenous socioeconomic outcomes between 2016 and 2021, including if the stringency of COVID-19 restrictions were correlated with any changes.
5. To understand the relationship between IRSEO and the new health indicators in the 2021 Census.

Measuring socioeconomic area-level outcomes for Aboriginal and Torres Strait Islander people

Over a number of years, researchers at the Australian National University have been examining the area-level and individual distribution of socioeconomic outcomes for the Indigenous population (Biddle, 2009, 2013; Biddle & Markham, 2017). Using as consistent a methodology as possible given the availability of data, we have examined outcomes for the 2001, 2006, 2011, and 2016 Censuses. This research has documented several empirical regularities that have stayed consistent over that period:

- there is a wide distribution of socioeconomic outcomes within the Indigenous population by area
- while Indigenous Australians living in remote areas tend to have worse socioeconomic outcomes than those living in non-remote areas, there are also a number of highly disadvantaged urban areas
- there is considerable stability through time at the area level in terms of socioeconomic outcomes (areas that are advantaged/disadvantaged at one time period tend to remain that way in future)
- in every area in Australia, the Indigenous population is more socioeconomically disadvantaged on average than the non-Indigenous population, and
- the gaps are largest in remote areas, but there are also a number of urban and regional areas with large divergences between Indigenous and non-Indigenous socioeconomic circumstances.

New data from the 2021 Census allows us to replicate this analysis and examine how the distribution of outcomes are changing over the short and the long term. New questions in the most recent census, and an increased availability of data also allow us to update and extend the analysis and gain new insights.

The 2021 Census and COVID-19

Australia's 2021 Census was conducted in some of the most unusual circumstances for data collections. Almost one-and-a-half years into a once-in-a-century pandemic, almost one-half of the Australian population were experiencing substantial lockdown restrictions as authorities battled to deal with the so-called 'delta wave' of infections (Edwards et al., 2022). Although the rest of the country was not experiencing as severe restrictions as New South Wales (NSW), Victoria, and the Australian Capital Territory (ACT), international borders were closed. Commonwealth as well as State/Territory governments were focusing on vaccinating as many Australians as possible as a means to minimise deaths and hospitalisations.

Indigenous people were widely thought to be at particular risk during the first two years of the COVID-19 pandemic (Markham et al., 2020). Pat Turner, the head of the Coalition of Peak Aboriginal and Torres Strait Islander Organisations was at the forefront of warning about potentially disproportionate impacts on Indigenous people in Australia, predicting in the early months of the pandemic that 'If COVID-19 gets into our communities we are gone' (Australian Broadcasting Corporation (ABC), 2020). A collaborative response between the Indigenous community-controlled sector and governments contributed toward keeping COVID-19 cases and mortality low among Indigenous people (Anthony & McGrady, 2022).

Despite or perhaps because of these pandemic conditions, the ABS was able to obtain a very high response rate for the 2021 Census. According to Harding et al. (2021),

> *[the] high response rate for private dwellings (96.1%) was an outstanding achievement given the challenges provided by the pandemic and is comparable to response rates seen in other countries, such as Canada and the United Kingdom, which undertook censuses during the pandemic.*

Consequently, we expect that the 2021 Census and analyses derived from it will have some differences from previous censuses in terms of the underlying circumstances it reports. For example, 21% of employed people reported working from home on Census night in 2021, up from 4.7% in 2016, a change that reflected pandemic restrictions on movement (ABS, 2022). However, there is little evidence to suggest that the accuracy of the data reported in the 2021 Census is significantly different to that in previous censuses.

We expect that responses to COVID-19, whether in the form of government measures or individual and community voluntary responses, will have had an impact on Indigenous and non-Indigenous socioeconomic outcomes. This is especially likely to be the case given the heightened pandemic response undertaken by some Indigenous communities. Accordingly, we investigate the relationship between change in Indigenous socioeconomic outcomes in 2016 and 2021 and the intensity of COVID-19 responses.

Methods for calculating socioeconomic indices

For the current version of the index, like the previous versions, we calculate index values for each Indigenous Area (IARE) in Australia. According to the ABS in describing the Indigenous Structure as part of the Australian Statistical Geography Standard (ASGS) Edition 3, IAREs are 'medium sized geographical areas designed to facilitate the release of more detailed statistics for Aboriginal and Torres Strait Islander people' (ABS, 2021). They can be aggregated to create Indigenous Regions, the most aggregated structure below state/territory as part of the Indigenous Structure.

In 2021, there were 431 IAREs, which were designed to cover the whole of Australia without gaps or overlaps. These are aggregated to form 59 Indigenous Regions. However, both of these structures incorporate 19 non-spatial special purpose codes, which includes migratory, offshore, shipping, outside Australia, and no usual

address codes. These were excluded from the analysis. In addition, we exclude IAREs which had less than 100 usual residents aged 15 years and over that stated their employment status, resulting in 405 IAREs in total that were analysed using 2021 Census data.

We allocate IAREs based on the following structural grouping based on the size, remoteness and Indigenous population share of the area:

- City areas – 96 IAREs
- Large regional towns – 49 IAREs
- Small regional towns and localities – 91 IAREs
- Regional rural areas – 25 IAREs
- Remote towns – 35 IAREs
- Indigenous towns – 49 IAREs, and
- Remote dispersed settlements – 33 IAREs.

Unlike some intercensal periods, there was minimal change in geographic boundaries between the 2016 and 2021 Censuses. We therefore allocate individual 2016 IAREs to 2021 IAREs using the ABS' area-level concordances, and then calculate the relevant percentages.

We update the Indigenous Relative Socioeconomic Outcomes (IRSEO) Index that summarises the distribution of outcomes for each IARE according to nine socioeconomic measures of the usual resident population of that area. These are the proportion of the:

- population 15 years and over employed
- population 15 years and over employed as a manager or professional
- population 15 years and over employed full-time in the private sector
- population 15 years and over who have completed Year 12
- population 15 years and over who have completed a qualification
- population 15 to 24 years old attending an educational institution
- population who live in a house that is owned or being purchased
- population who live in a household with equivalised income above one-half the Australian median,[1] and
- population who live in a household not identified as overcrowded based on the Canadian National Occupancy Standard.[2]

There have been two minor updates to the IRSEO since the 2016 version, focusing on the last two of the variables listed above. Previously, we used individual-level rather than household-level income for the second-

[1] Equivalised income is calculated by first aggregating the personal incomes reported by all household members aged 15 years and over and applying a weighting according to the 'modified OECD' equivalence scale. The equivalence factor is built by summing all equivalence points allocated to each person in a household as follows: 1 point to the first adult; 0.5 points to each additional person who is 15 years and over; and 0.3 points to each child under the age of 15. We do not allocate people to Indigenous or non-Indigenous households when calculating household income or other household-level measures. Rather, we analyse individuals based on their own Aboriginal or Torres Strait Islander Status, and apply household level values to those individuals. That is, we estimate the per cent of Aboriginal and Torres Strait Islander Australians in an area with a particular household characteristic (e.g. income above half the median), rather than the per cent of Indigenous-households.

[2] This is a measure of housing appropriateness that is based on the number of bedrooms in the dwelling, as well as household size and composition: https://www.abs.gov.au/census/guide-census-data/census-dictionary/2021/variables-topic/housing/housing-suitability-hosd

to-last measure. We also previously used the proportion of the population who live in a house with at least one bedroom per usual resident rather than the more nuanced overcrowding measure. When we compared the distribution of 2016 areas using the new and old methodologies, there was substantial overlap.[3]

The loadings (or weights) given to each of the nine measures in the IRSEO were calculated using principal components analysis (PCA). According to Jolliffe and Cadima (2016), PCA is 'a technique for reducing the dimensionality of [large] datasets, increasing interpretability but at the same time minimising information loss. It does so by creating new uncorrelated variables that successively maximise variance.' We undertake the PCA for each year separately, and because of the very high correlation across the underlying socioeconomic variables, focus on the first component only. In 2021 this first component had an Eigenvalue of 6.67, or 74.1% of the overall variance. Results were quite similar in 2016 (Eigenvalue of 6.38 or 70.9% of overall variance) and for both years the loadings for each of the individual variables were very close to or above 0.3 (see Table A1 in the appendix).[4]

We then rank IAREs based on this first component, and allocate IAREs to percentiles with the lowest value of 1 for the IARE with the most socioeconomically advantaged Aboriginal and Torres Strait Islander population and the highest value (100) for the IARE with the most disadvantaged population.

The IRSEO index contains information on the relative socioeconomic position of Aboriginal and Torres Strait Islander Australians who live in one area compared to those who live in another. It also allows us to measure the change through time in this relative distribution. It has no information, however, on the difference between Indigenous and non-Indigenous outcomes in a particular area. In order to make comparisons with the non-Indigenous population, we therefore create a Pooled Indigenous and Non-Indigenous Relative Socioeconomic Outcomes (PINIRSEO).

To calculate the PINIRSEO we first estimate the underlying percentages for the nine socioeconomic measures for the non-Indigenous population in the IARE (those who did not state their Indigenous status are excluded from the analysis). We then exclude IAREs where either the Aboriginal or Torres Strait Islander or the non-Indigenous population had less than 100 usual residents aged 15 years and over that stated their employment status. This left 362 IAREs in total. The Aboriginal and Torres Strait Islander and non-Indigenous percentages for each IARE left in the sample were then treated as separate observations, and pooled into a sample of 724 observations.

A PCA was undertaken on the pooled Indigenous and non-Indigenous sample, with similar results to the Indigenous only analysis (first Eigenvalue equal to 5.9, or 65.6% of total variance explained). The combined sample was then ranked by percentile (from most advantaged to most disadvantaged) with each of the 362 IAREs in the sample allocated a PINIRSEO for the Indigenous and non-Indigenous population. For those IAREs that have an IRSEO and PINIRSEO calculated for the Aboriginal and Torres Strait Islander population, the correlation in the rankings was very high (0.9460).

[3] The rank-order correlation of areas using the old 2016 index and the new 2021 index is 0.9815.
[4] In 2021, the loading for the owner/purchaser variable was 0.2936 with all other variables having a loading above 0.3, and for 2016 all variables had a loading of above 0.3

The need for an Indigenous-specific index

In this section, we revisit the necessity for an Indigenous-specific metric for socioeconomic outcomes. It is sometimes suggested that total population indices such as the SEIFA fail to accurately represent the socioeconomic status of Indigenous populations across the country. The main reasons for this discrepancy include:

1. The relatively small size of the Indigenous population means that in most areas only a small proportion of the population in areas used for index calculation are likely to be Indigenous. Thus, standard SEIFA indices predominantly reflect the characteristics of the non-Indigenous population, inadequately portraying the distribution of Indigenous socioeconomic outcomes. Indigenous and non-Indigenous socioeconomic outcomes do not follow the same spatial distribution. For example, non-Indigenous incomes are often higher in very remote areas than in major cities, while Indigenous incomes are lowest in very remote areas (Langton & Mazel, 2008).
2. The socioeconomic status of the Indigenous population is consistently lower across the country compared to that of non-Indigenous residents in the same location (Biddle, 2013; Kennedy & Firman, 2004). Consequently, the use of mainstream SEIFA indexes can mask Indigenous disadvantage.
3. The Index of Socioeconomic Disadvantage (IRSD), a frequently used SEIFA index, included the proportion of Indigenous people in a given area as a variable until the 2011 Census. This assumption of Indigenous deficit is much critiqued in Indigenous research (e.g. Walter, 2016). It also introduced a strong upward bias on measures of average disadvantage in areas mostly inhabited by Indigenous people. Consequently, correlations between this index and the proportion of Indigenous persons were always significant, as the proportion of Indigenous persons was an input variable. While this has been changed in more recent SEIFA publications, attempts to track change in socioeconomic status over time for Indigenous people are confounded by the inclusion of this variable in the model.
4. Certain variables in standard SEIFA indices that are indicators of disadvantage for non-Indigenous Australians may not be indicators of disadvantage for Indigenous populations. For instance, the typical timing of life events such as child-rearing and higher education is different for Indigenous and non-Indigenous people in Australia. As this may reflect differing values, a singular index of advantage and disadvantage for the whole population that includes educational attainment will be biased for Indigenous people.
5. Certain variables in standard SEIFA indices poorly reflect their underlying construct in some Indigenous contexts. For example, in many remote areas, an absence of jobs means that many Indigenous people who would like to work do not get classified as ‘unemployed’ in the census. Instead, these individuals are classified as being ‘not in the labour force’.

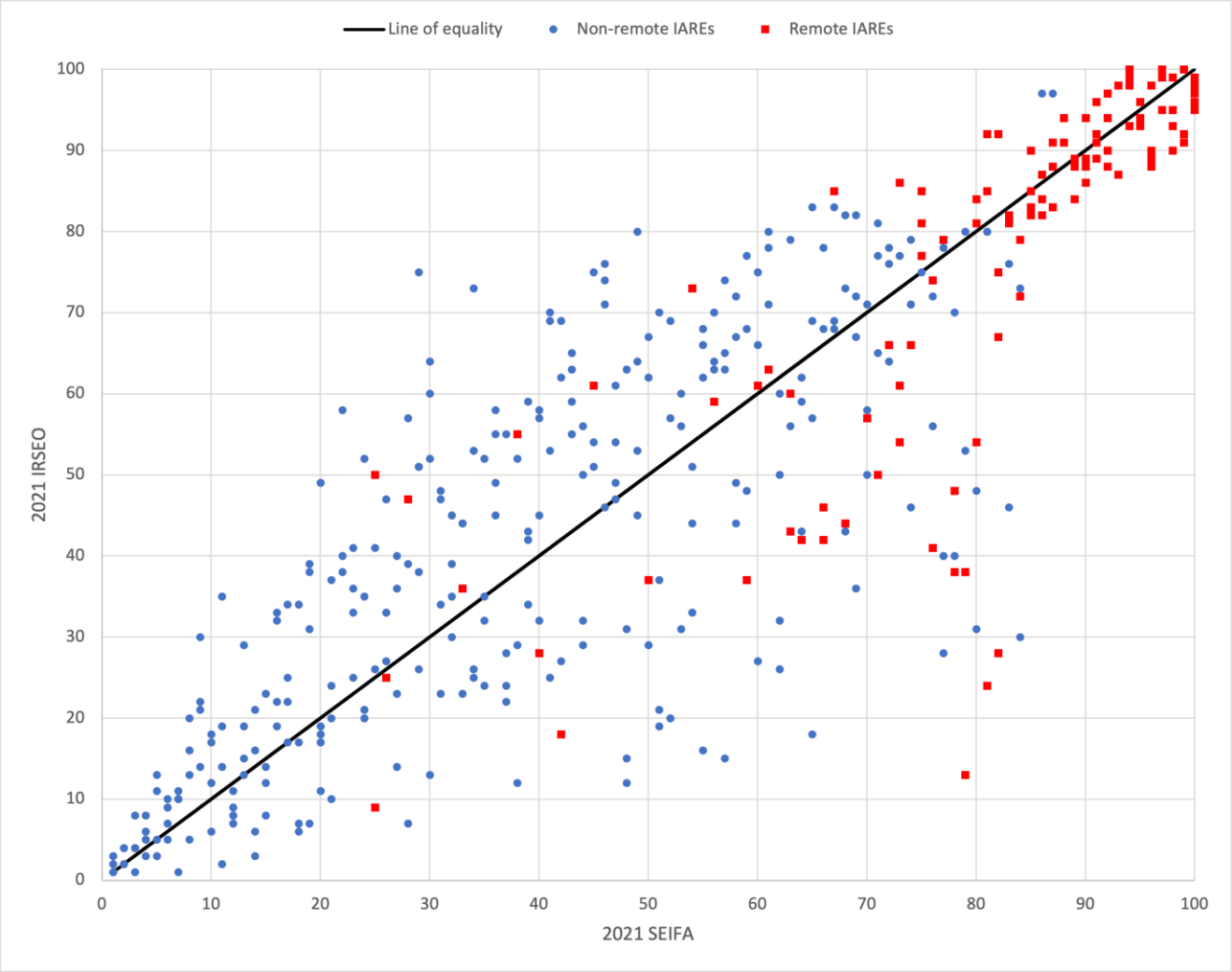
To investigate the extent to which this continues to matter in practice, we constructed a percentile ranking of the 2021 SEIFA Index Relative of Advantage and Disadvantage (IRSAD) for Indigenous Areas by population weighting IRSAD scores at the Statistical Area 1 (SA1) level up to Indigenous Areas. This allows us to compare our Indigenous-specific IRSEO index against the mainstream SEIFA IRSAD index in the same geographical areas.

In doing so, it is worth considering that different variables are included in IRSAD and IRSEO (Biddle, 2009). IRSAD includes additional variables relating to occupation, disability, jobless families, amount of paid for housing, single parent households, divorce and separation, large houses, educational attainment, and high income. Variables included in both indices are compared in Table A2 (in the appendix).

Figure 1 shows a scatterplot of the two indices, with each point in the plot representing one Indigenous area. On the y-axis is each area's IRSEO percentile rank, with 0 being the most advantaged and 100 being the most disadvantaged. On the x-axis is each area's SEIFA IRSAD percentile rank, with 0 being the most advantaged and 100 being the most disadvantaged. These rankings are well correlated ($r = 0.85$, $p < 0.001$), but there are many outliers for which the use of SEIFA IRSAD scores is highly misleading. For example, the Nhulunbuy – Gunyangara Indigenous area ranks on 79th percentile on IRSEO (i.e. highly disadvantaged) but in 13th percentile for SEIFA IRSAD (i.e. highly advantaged). This is likely to reflect both a polarisation in socioeconomic outcomes between Indigenous and non-Indigenous residents of that area, and a non-Indigenous majority population (>80% non-Indigenous). An opposite type of outlier can be found in the Tasmania – West Coast Indigenous area. This area is among the top 30% of areas in terms of Indigenous socioeconomic outcomes in IRSEO, but is in the bottom 25% of socioeconomic outcomes overall in SEIFA IRSAD. This doesn't mean that the Indigenous population of the area is more advantaged than the non-Indigenous population of the area. Rather, it indicates an Indigenous population that is moderately prosperous relative to all Indigenous people in Australia, while being part of a community that is considered disadvantaged by non-Indigenous Australian standards. Figure 1 also distinguishes between Indigenous areas on the basis of remoteness. It is notable that remote areas are over-represented among those in the bottom right corner of the figure (i.e. those relatively disadvantaged according to IRSEO but relatively advantaged according to SEIFA, such as Nhulunbuy – Gunyangara).

Figure 1 suggests that while for most Indigenous areas there is a strong correspondence between relative Indigenous socioeconomic outcomes and relative total socioeconomic outcomes, in 2021 there were many Indigenous areas in which this relationship does not hold. For that reason, we consider it important to continue to develop the IRSEO.

Figure 1 Comparing Indigenous Relative Socioeconomic Outcomes (IRSEO) Index percentile rankings in 2021 with Socio-Economic Indices for Areas (SEIFA) Index Relative of Advantage and Disadvantage (IRSAD), Indigenous areas, 2021

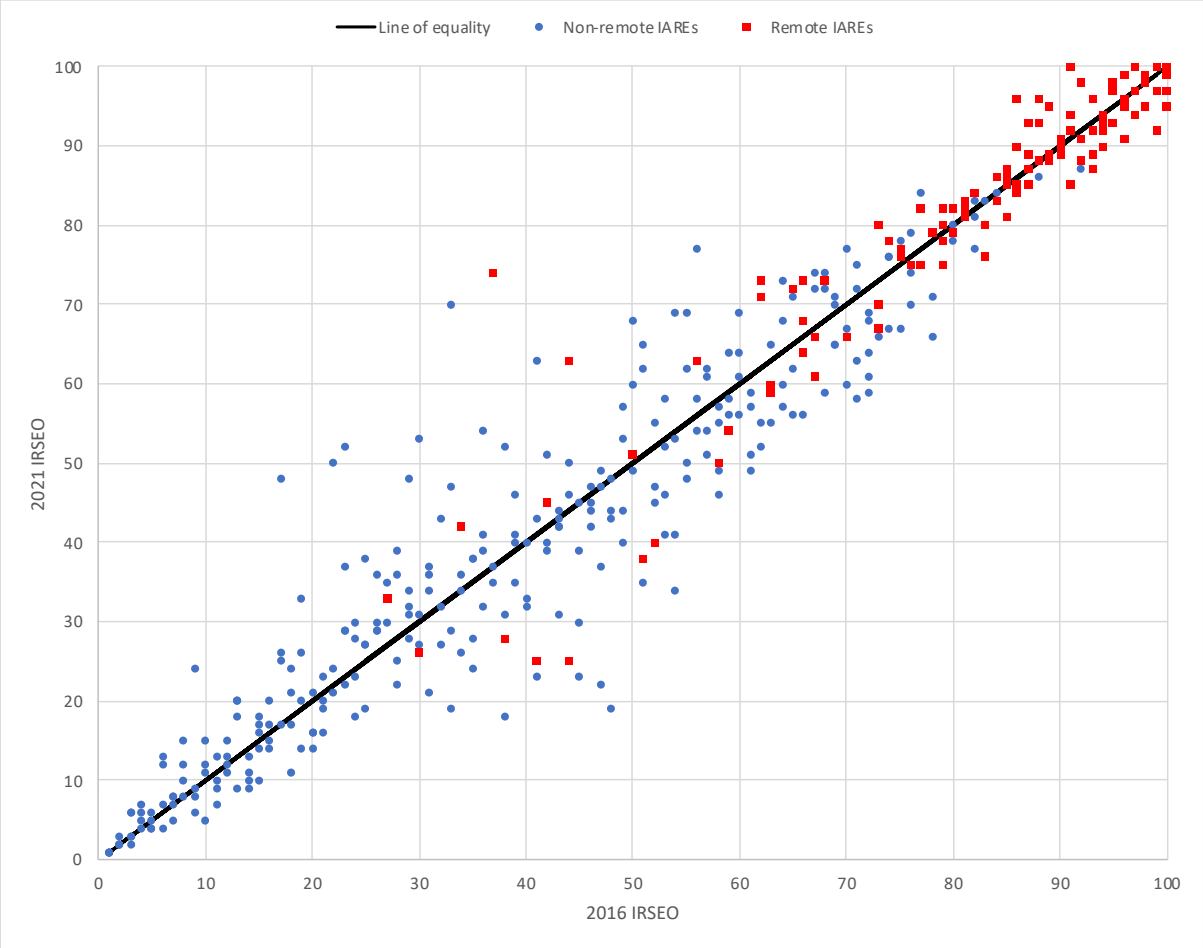


The distribution of socioeconomic outcomes by area within the Indigenous population is widening

The distribution of Indigenous socioeconomic outcomes in 2016 and 2021 for 405 Indigenous Areas across Australia is summarised in Figure 2. A low value indicates that the Indigenous usual residents of that area were relatively advantaged in the relevant year, whereas a high value indicates they are relatively disadvantaged. Areas above the 45-degree line are those that have worsened (relatively) over the last inter-censal period, whereas those below the line have improved. Because this is a relative measure, it is important to remember that for each area that improves in socioeconomic ranking, another area must record relatively worsened outcomes.

Blue dots are those IAREs that in 2016 were in a non-remote part of Australia (City areas, Large regional towns, Small regional towns and localities, and Regional rural areas). The red squares are for remote IAREs (Remote towns, Indigenous towns, and Remote dispersed settlements).

Figure 2 Indigenous Relative Socioeconomic Outcomes (IRSEO) Index percentiles, 2016 and 2021



The most advantaged IAREs (with low IRSEO scores) tend to be in non-remote parts of the country, whereas the most disadvantaged IAREs (with high IRSEO scores) tend to be in remote Australia. All four areas in the most advantaged percentile are city areas: Sydney – Lower North (NSW); Woollahra – Waverley (NSW); Melbourne – East (Victoria); and Northern Beaches (NSW). By contrast, the IAREs in the most disadvantaged percentile are either Indigenous towns or remote dispersed settlements in the Northern Territory – Walungurru and Outstations; Lajamanu; Ampilatwatja and Outstations; Haasts Bluff – Mount Liebig (Watiyawanu); and Wutunugurra – Canteen Creek.

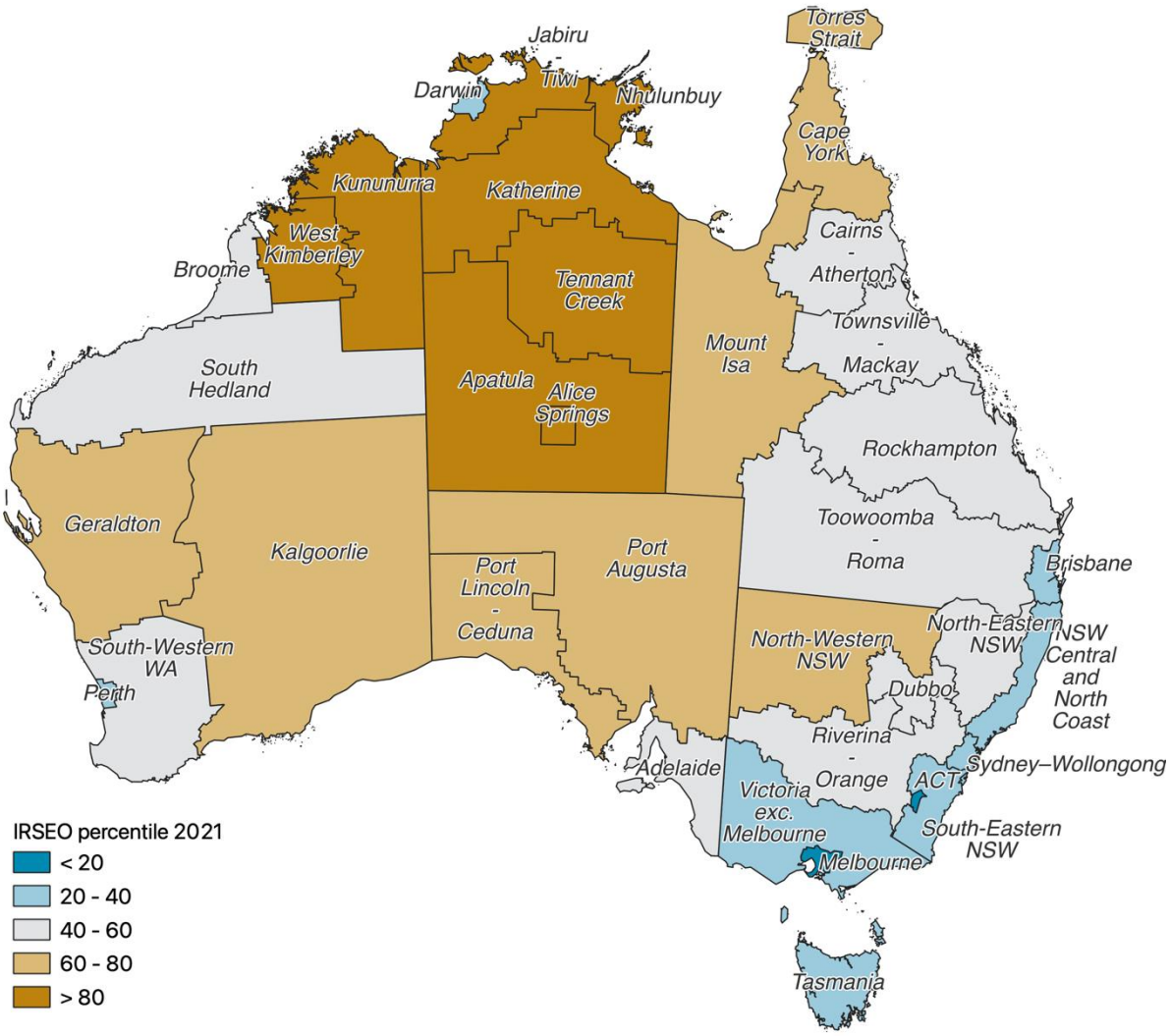
While there is a general non-remote to remote distribution in terms of disadvantage, there are some exceptions. There are three IAREs that are classified as city areas that are nonetheless in 65th percentile or below (roughly the bottom one-third of the distribution) – Blacktown (NSW); Playford (South Australia); and Gosnells (Western Australia). At the other end of the distribution, there are five IAREs that are classified as remote towns that are in the top one-third of the distribution (most advantaged) – Bogan (NSW); Karratha (Western Australia); Exmouth – Ashburton (Western Australia); Flinders – Richmond – Dalrymple (Queensland); and Barcaldine – Blackall – Longreach (Queensland).

Figure 2 also shows that IAREs that were relatively advantaged/disadvantaged in 2016 tended to be relatively advantaged/disadvantaged in 2021. Indeed, the correlation between the two rankings was 0.9655. There were, however, a number of exceptions, with values quite far above the 45-degree line (they became more relatively disadvantaged) or quite far below the line (they became more relatively advantaged).

The three areas that worsened the most over the period are Litchfield (Northern Territory); Malak (Northern Territory); and Cooktown (Queensland). The three areas that improved the most over the last intercensal period are Fremantle (Western Australia); Sarina (Queensland); and Eacham (Queensland).

Figure 3 maps the geographical distribution of IRSEO percentiles. Because many Indigenous Areas relate to areas that are too small to be visible on a national-scale map, IRSEO percentiles are aggregated up to the Indigenous Region level using Indigenous population-weighted means. Regions coloured blue have lower average IRSEO percentiles and are relatively more advantaged, while regions coloured gold have higher average IRSEO percentiles and are relatively less advantaged. It shows that relative advantage is most strongly concentrated in the Melbourne Indigenous region, and disadvantage most strongly concentrated in the Northern Territory (beyond Darwin) and the Kimberley.

Figure 3 Average IRSEO percentiles for Indigenous Regions, 2021



In general, there is evidence that inequalities in average Indigenous socioeconomic status between areas have widened between 2016 and 2021. Figure 4 shows the distribution of raw IRSEO scores (i.e. prior to ranking) for 2021 (solid line) and 2016 (dashed line). More advantaged areas have a higher raw IRSEO score, with the average IRSEO score across all areas set to zero. It shows that IRSEO scores have a bimodal distribution, with two clusters of areas: a large group of areas that have slightly above average IRSEO scores, and then a smaller group of highly disadvantaged areas. The distance between the ‘peaks’ in Figure 4 (i.e., the modes of these two

clusters of areas) has increased between 2021 and 2016. Overall, the standard deviation of IRSEO scores increased from 2.54 in 2016 to 2.61 in 2021. This suggests that inequalities in socioeconomic outcomes by area within the Indigenous population have widened between 2016 and 2021.

Figure 4 Distribution of Indigenous Relative Socioeconomic Outcomes (IRSEO) Index scores, 2016 and 2021

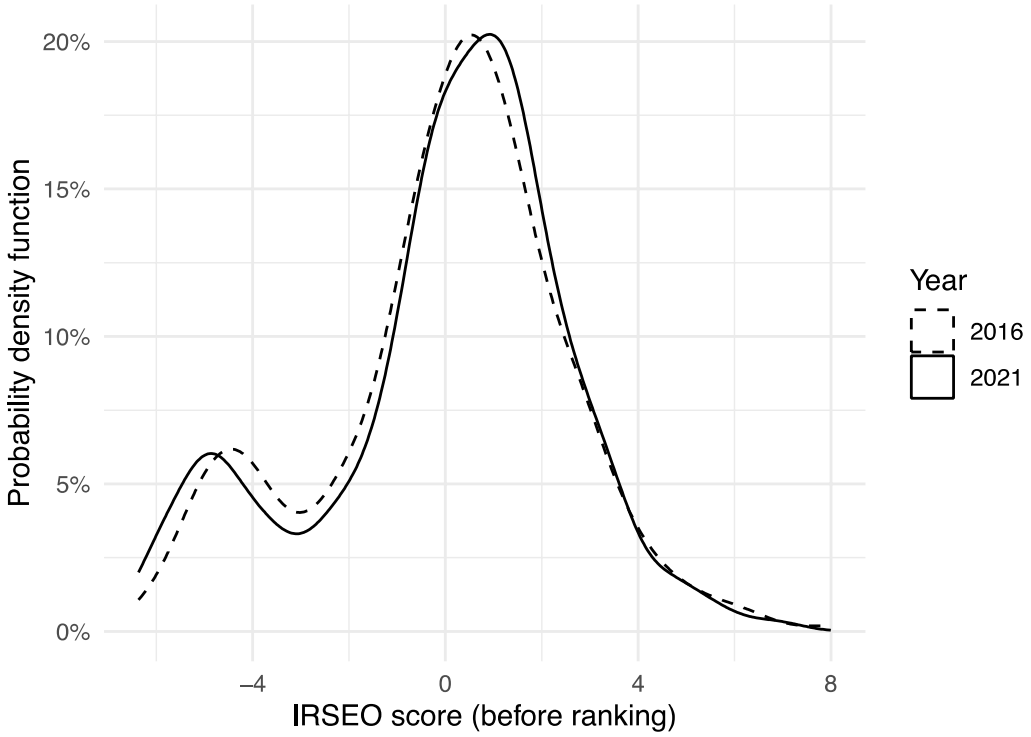
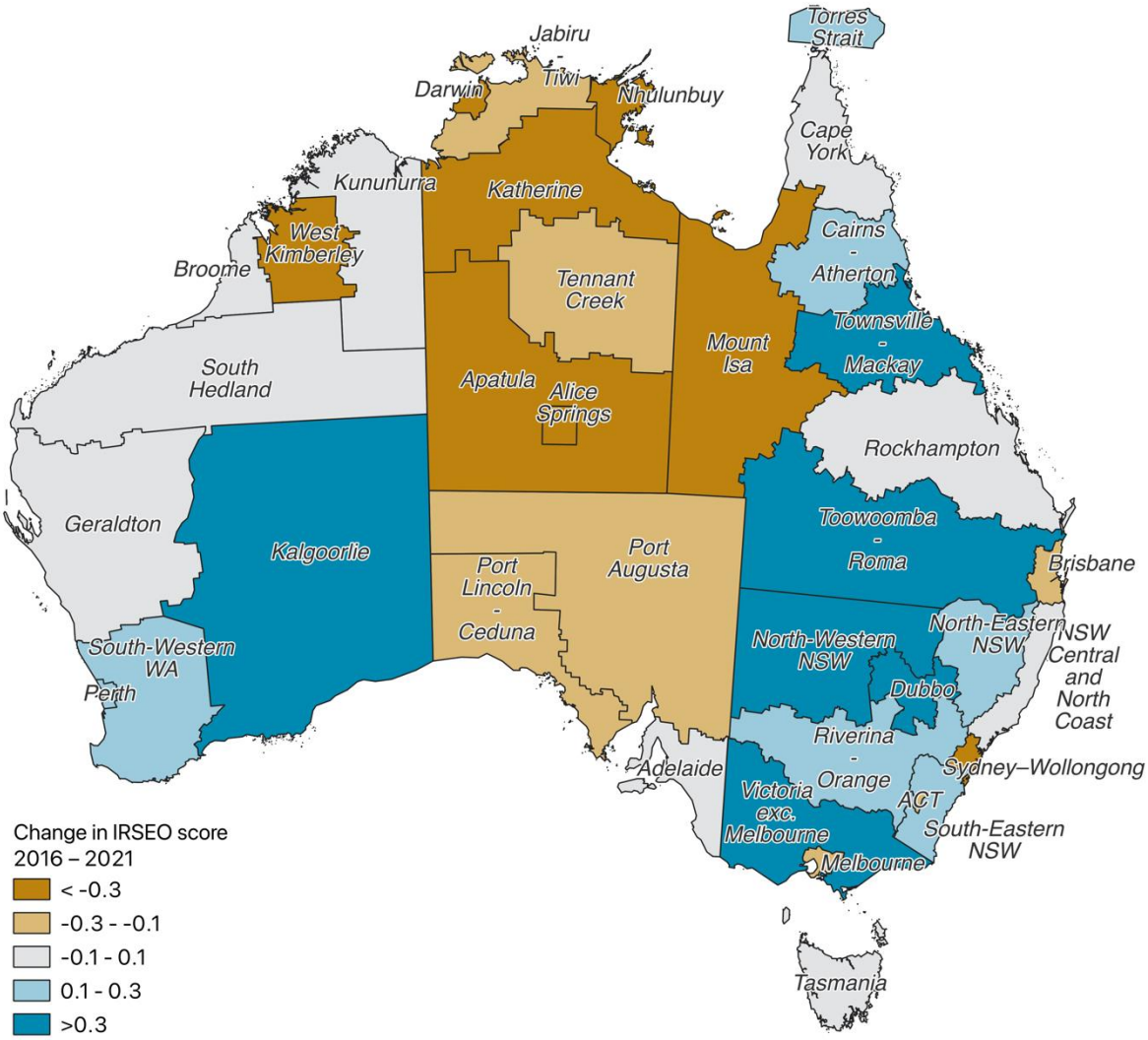


Figure 5 maps the spatial distribution of these widening inequalities. It shows strong relative increases in Indigenous socioeconomic status in regional Australia, particularly in regional NSW, Victoria and parts of regional Queensland and Western Australia. It also shows worsening relative Indigenous socioeconomic outcomes not just in much of remote Australia – especially in the Northern Territory, the Mount Isa region of Queensland, and West Kimberley – but also in most capital city regions, with the exclusion of Perth and Adelaide. This pattern of the worsening of relative socioeconomic outcomes in capital cities is new. It is unclear if it is a temporary effect resulting from pandemic restrictions, a failure to keep up with improvements in regional areas, or a longer-run structural change.

Until individual-level data with a longitudinal component is made available, it is impossible to tell whether these changes are due to improved or worsening outcomes for those who live in the area, a change in the composition of those who live in the area due to internal migration, or a change in the population composition due to identification change. However, we will return to some of the potential explanations for changes in outcomes later in the paper.

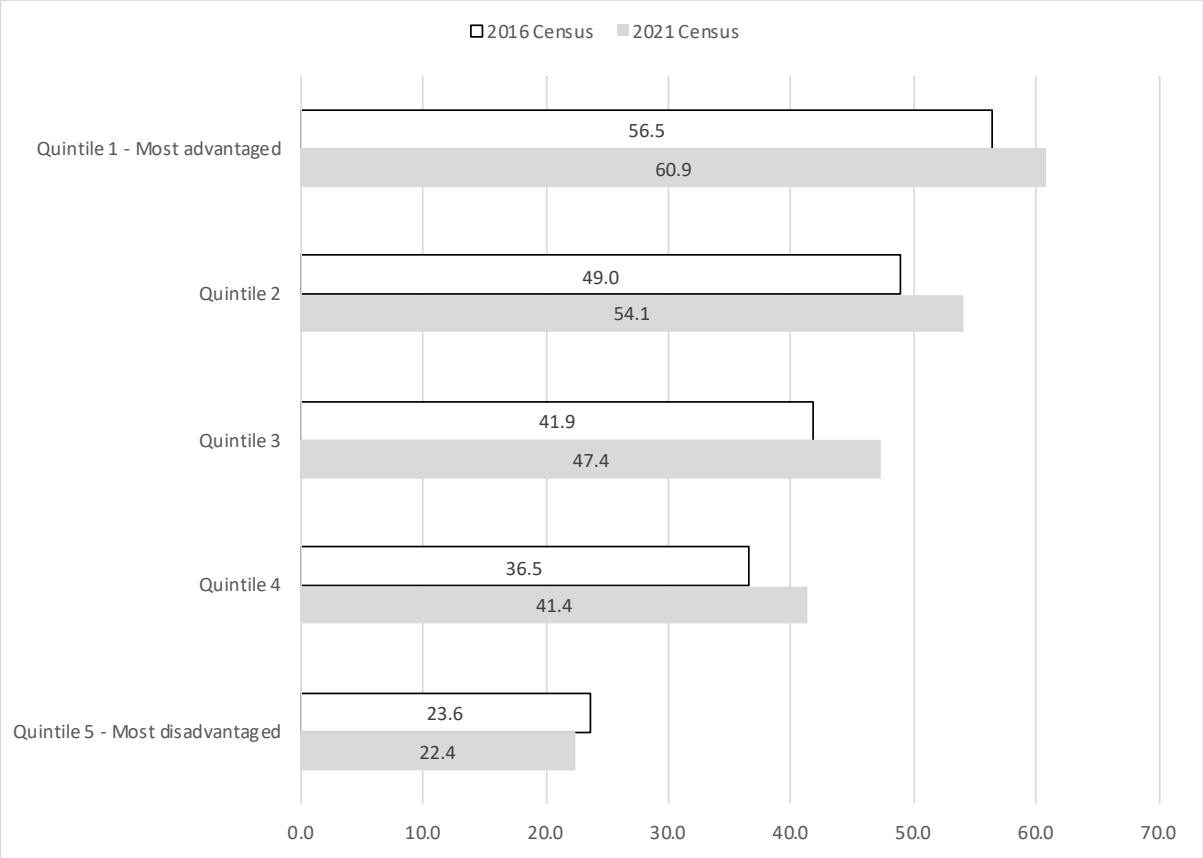
Figure 5 Change in IRSEO scores for Indigenous Regions, 2016–2021



We can further see the widening in the geographic distribution of socioeconomic outcomes through a comparison of area-level employment rates in 2016 and 2021. For both 2016 and 2021, the Eigenvector for employment is highest amongst the nine socioeconomic measures, suggesting a relatively high level of correlation with the other eight measures, and a particular contribution to the overall index. Across the 408 in-scope Indigenous Areas, average employment rates amongst the Aboriginal and Torres Strait Islander population aged 15 years and over were 41.5% in 2016 and 45.2% in 2021. So, there has been an improvement in employment outcomes. However, there has also been an increase in inequalities among the employment rates of Indigenous Areas, with a standard deviation of 13.0 in 2016 widening to 14.4 in 2021.

As shown in Figure 6, this widening has occurred through the middle and the upper part of the geographic distribution moving further away from the bottom. Specifically, the employment rate for the most disadvantaged quintile (20%) of areas in 2021 was 1.2 percentage points lower than the most disadvantaged quintile in 2016. For all other quintiles, but particularly the middle (third) quintile, there was an improvement in employment over the last intercensal period.

Figure 6 Aboriginal and Torres Strait Islander Australians aged 15 years and over, employment rate (%), by quintile of Indigenous Relative Socioeconomic Outcomes (IRSEO) Index, 2016 and 2021

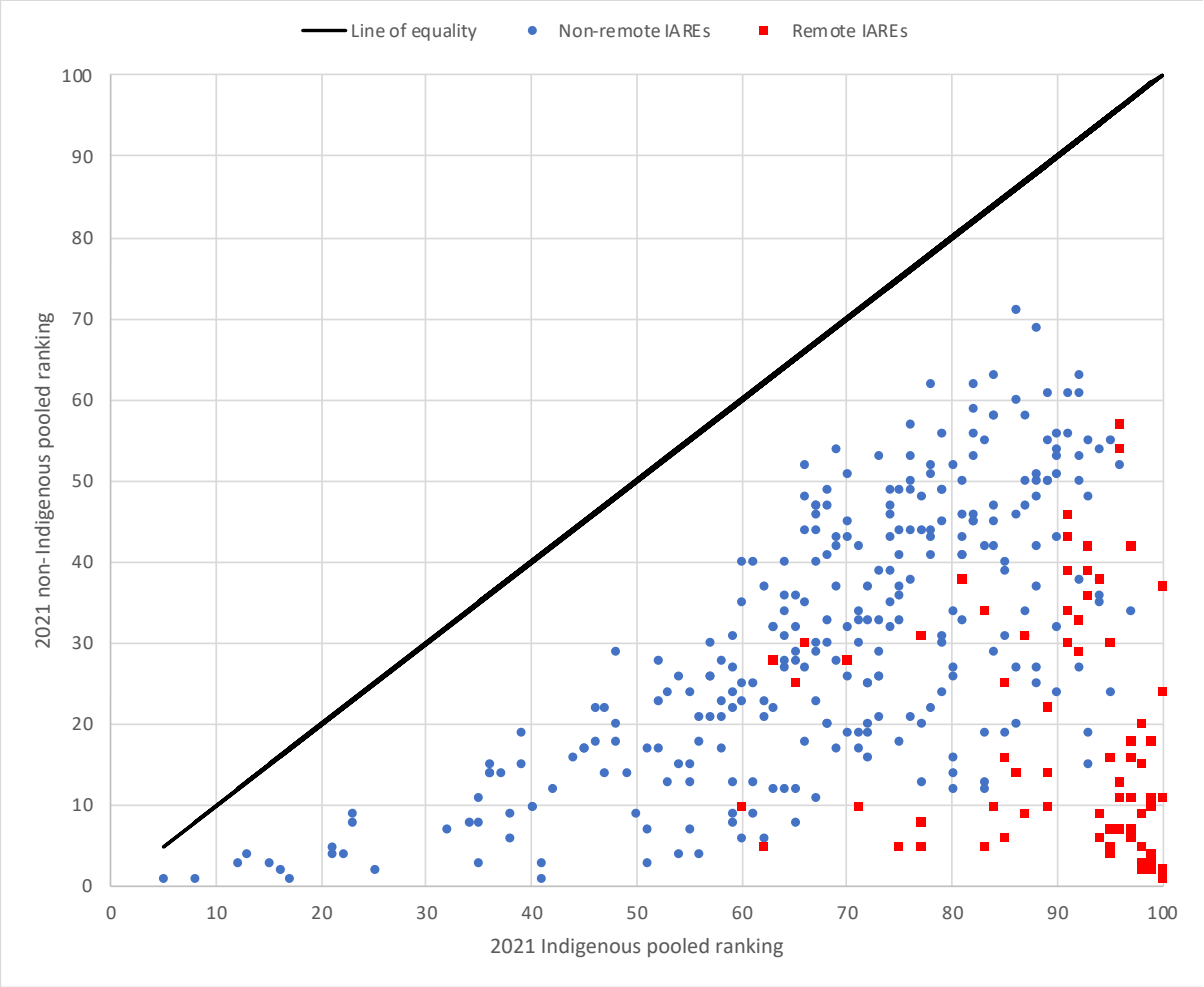


Comparisons between Indigenous and non-Indigenous Australians

The PINIRSEO Index has been designed to facilitate comparisons between the Aboriginal and Torres Strait Islander and non-Indigenous populations in an area. When we look at the Indigenous observations in the pooled distribution, the average percentile rank was 72.8. For the non-Indigenous observations, the average rank was 28.2, meaning there was an average gap of 44.6 percentiles between the socioeconomic characteristics of the Indigenous population in an area and the non-Indigenous population.

Figure 7 summarises the distribution in more detail in 2021 for the 362 Indigenous Areas with at least 100 Indigenous adults and at least 100 non-Indigenous adults. The level of disadvantage for the Aboriginal and Torres Strait Islander population in the IARE is plotted on the X-axis, whereas the level of disadvantage for the non-Indigenous population in the same area is plotted on the Y-axis.

Figure 7 Pooled Indigenous and non-Indigenous Relative Socioeconomic Outcomes (PINIRSEO) Index, 2021



The simplest way to interpret the above figure is to keep in mind that if the outcomes of the Indigenous population in an area were better than the non-Indigenous population in the same area, then the area would be plotted above the black 45-degree line. If the outcomes were the same, then it would be on the line, and if the outcomes were worse amongst the Indigenous population, then the dot would be below the line. The distance from the line represents the within-area gap between Indigenous and non-Indigenous outcomes.

The areas with the largest gaps tended to be in remote areas (the red squares), whereas those with the smallest gaps tended to be in non-remote areas (the blue dots). However, there was no area in Australia where the Aboriginal or Torres Strait Islander population had better or equal outcomes to the non-Indigenous population.

The changing geography of Indigenous socioeconomic outcomes: Did COVID-19 restrictions play a part?

The previous sections showed that Aboriginal and Torres Strait Islander Australians in IAREs in remote parts of the country tend to be more disadvantaged than those in non-remote parts of the country, and tend to have a larger gap with the non-Indigenous population in their area. As shown in Table 1, however, there is still substantial variation within these regional groupings, even if the general patterns are quite consistent.

Table 1 demonstrates a divergence between location types in terms of their place in the ranking of socioeconomic outcomes between 2016 and 2021. City areas and large regional towns increased their relative socioeconomic status, while smaller regional towns and regional rural areas fell further behind. In remote Australia, remote towns and Indigenous towns increased their rankings, while the relative socioeconomic status of the most remote dispersed settlements declined.

Table 1 Summary of area-level socioeconomic outcome percentiles by location type (lower percentiles are more advantaged), 2016–2021

Location type	IRSEO 2021				PINIRSEO gap		
	Mean	Min	Max	2016 change	Mean	Min	Max
City areas	22.2	1	69	-1.6	35.7	4	66
Large regional towns	42.3	5	84	-1.1	40.2	19	85
Small regional towns	51.1	9	87	1.4	37.3	14	78
Regional rural areas	41.6	3	84	2.6	33.2	16	63
Remote towns	64.1	25	98	-0.8	59.9	35	89
Indigenous towns	89.6	45	100	-0.4	88.3	72	99
Remote dispersed settlements	85.6	40	100	0.2	79.0	42	99

When analysed simultaneously by location type and state, and using raw IRSEO scores rather than rankings, a more nuanced picture emerges. Table 2 shows a linear regression analysis that examines which area-level characteristics were associated with changes in raw IRSEO scores between 2016 and 2021. A positive change in IRSEO means an increase in relative advantage, which a negative change implies that an area is becoming relatively disadvantaged. In the model we control for population change, as well as the IRSEO value in 2016. We control for the latter due to floor and ceiling effects (whereby it is less likely for those areas at the upper/lower part of the distribution to increase/decrease their IRSEO values) and reversion to the mean (whereby random variation in the population in an area and their characteristics means that areas above/below the mean by chance in one census tend to decrease/increase their value). We estimate two models, the first which does not explicitly attempt to measure the impact of COVID-19 restrictions and one which includes a geographical measure of the stringency of state responses to COVID-19.

The first regression analysis finds increases in relative advantage in regional areas between 2016 and 2021. Compared to city areas, large regional towns, rural regional areas and small regional towns saw increases in IRSEO scores, with the difference between small regional towns and city areas statistically significant. Remote

towns, remote dispersed settlements and Indigenous towns saw declining IRSEO scores compared to city areas, with the latter two location types have large and statistically significant coefficients.

At the state level, Victoria saw a significant increase in Indigenous socioeconomic outcomes relative to NSW. At the same time, the socioeconomic status of areas in the Northern Territory declined relative to NSW. There were no significant differences between NSW and other jurisdictions.

In the introduction to this paper, we highlighted the very rapid growth in the number of Aboriginal and Torres Strait Islander Australians counted in the 2021 Census relative to the 2016 Census. While substantial growth between censuses is not unprecedented (it was also observed between 2006 and 2011 as well as 2011 and 2016) the size of the growth was even greater over the last intercensal period.

Table 2 Area-level correlates of the change in IRSEO scores between 2016 and 2021 (higher scores are more advantaged)

Explanatory variables	Simple model		Model including covid response	
	Coefficient[1]	95% CI[2]	Coefficient[1]	95% CI[2]
Constant	0.140	-0.026, 0.308	0.784*	0.075, 1.492
IRSEO in 2016	-0.043*	-0.080, -0.006	-0.038*	-0.076, 0.000
Unexplained growth in population between 2016 and 2021 (%)	-0.010***	-0.013, -0.006	-0.010***	-0.014, -0.006
COVID response stringency			-0.007	-0.015, 0.001
Location type				
City areas	—	—	—	—
Indigenous towns	-0.426**	-0.708, -0.143	-0.416**	-0.698, -0.134
Large regional towns	0.113	-0.048, 0.275	0.085	-0.079, 0.249
Regional rural areas	0.249*	0.006, 0.492	0.227	-0.017, 0.470
Remote dispersed settlements	-0.287	-0.574, 0.000	-0.285	-0.571, 0.001
Remote towns	-0.107	-0.328, 0.115	-0.110	-0.331, 0.111
Small regional towns	0.166	-0.003, 0.334	0.144	-0.025, 0.314
State				
NSW	—	—	—	—
Vic	0.188*	0.003, 0.373	0.147	-0.043, 0.337
Qld	0.083	-0.066, 0.232	-0.035	-0.231, 0.160
SA	-0.079	-0.278, 0.120	-0.283	-0.579, 0.012
WA	-0.022	-0.186, 0.143	-0.269	-0.581, 0.043
Tas	-0.017	-0.334, 0.300	-0.215	-0.596, 0.166
NT	-0.457***	-0.659, -0.254	-0.699***	-1.03, -0.370
ACT	0.081	-0.620, 0.782	-0.133	-0.868, 0.603

[1] *p<0.05; **p<0.01; ***p<0.001

[2] CI = Confidence Interval

At the IARE-level, the average growth in the count was 19.5% between 2016 and 2021, of a similar magnitude to the national-level change. However, this hides substantial variation, with a standard deviation across areas equal to 24.5. In other words, there were many areas that had a decline in their Aboriginal and Torres Strait Islander population, even if many more had a large increase.

In order to understand the relationship between population growth and socioeconomic change, we calculate an 'unexplained' growth measure. For this measure we start with the observed population growth in the area over the last intercensal period. We then exclude births (as proxied by the number of children aged 0–4 in the 2021 Census), expected deaths (by applying the remoteness-specific death rate to the 2016 population counts, and net migration (through an IARE-specific migration matrix of usual residents). Across Indigenous Areas, unexpected growth averages 12.2 as a per cent of the 2016 population, with a standard deviation of 19.1.

Perhaps surprisingly, there is a weak but negative relationship between the change through time in the IRSEO at the IARE-level and unexpected population change. This suggests that those areas that had more rapid population growth than suggested by natural population increase and mobility experienced a relative decline in socioeconomic status.[5] Although most of the unexplained growth is likely to have come from identification change, this does not mean that identification change directly impacts on the outcomes of those who change how they are identified in the census, or the rest of the Aboriginal and Torres Strait Islander population in the area in which they live. Estimating those complex relationships is best explored using linked individual-level data.

Due to the potential impact of the geographically uneven distribution of government restrictions on mobility and activity due to COVID-19, we estimated a second model which includes as an explanatory variable an index of the stringency of pandemic responses in Indigenous Areas. This 'Stringency Index' data was drawn from the 'Oxford COVID-19 Government Response Tracker' database (Hale et al., 2021). The Stringency Index is a measure of 'containment and closure policies, sometimes referred to as lockdown policies' and is derived from ordinal measures of nine types of government pandemic response: school and university closures; workplace closures; cancellation of public events; restrictions on gatherings of certain sizes; public transport closures; 'stay-at-home' orders; restrictions on domestic mobility; restrictions on international travel; and COVID-19 public information campaigns. Australian data on response stringency was made available disaggregated by State/Territory and Greater Capital City/Rest of State (Edwards et al., 2022). We extracted stringency indices for Census night in 2021 and concorded Indigenous Areas to Greater Capital City Areas using Indigenous population-weights at the Statistical Area 1 level.

We found no statistically significant spatial correlation between the stringency of the COIVD-19 response and the change in Indigenous socioeconomic outcomes at the area level between 2016 and 2021. However, coefficient estimate is suggestive of reduced relative socioeconomic outcomes in areas with a more stringent COVID-19 response. Inclusion of this variable in the model also affects estimates for other outcomes. In particular, the improvement in relative socioeconomic outcomes in regional rural areas is no longer statistically significant once the stringency index is introduced into the model, suggesting that the relative improvement in outcomes in the regions may be a result of the relative permissiveness of COVID-19 responses there. In contrast, the relative decline in the socioeconomic outcomes in the Northern Territory is estimated to be even greater once differences in COVID-19 responses is accounted for.

In interpreting these changes, it should be considered that COVID-19 may have impacted on outcomes in ways that we have not accounted for in these models. For example, the international border closures may have increased labour demand in areas which are usual destinations for international migrants, including in regional

[5] This finding holds when we analyse within the non-COVID affected states and territories, and there is a higher R squared in the model when using unexpected population growth compared to raw population growth.

areas where Indigenous employment growth was considerable. On the other hand, the pivot to working-from-home in certain occupations may have disadvantaged Indigenous workers whose households who are less likely to have internet access at home (Dinku et al., 2020). This complex picture is further complicated because some people may have changed their place of residence in response to the pandemic, perhaps leaving major cities to communities in regional areas, and thereby changing the socioeconomic outcomes by changing the composition of regional populations. More detailed research is needed to investigate these possibilities.

Relationship with the new health indicators in the Census

For the first time in Australia, the 2021 Census included a set of questions on whether a person had one or more long-term health conditions. Respondents were asked to select all long-term conditions that the person had (from a list of 11). Specifically, the question asked 'Has Person 1 been told by a doctor or nurse that they have any of these long-term health conditions?' In the notes to the question, respondents were instructed to include 'health conditions that have lasted or are expected to last for six months or more' as well as 'health conditions that: may recur from time to time, or are controlled by medication, or are in remission'.

The long-term conditions were:

- arthritis
- asthma
- cancer (including remission)
- dementia (including Alzheimer's)
- diabetes (excluding gestational diabetes)
- heart disease (including heart attack or angina)
- kidney disease
- Llung condition (including COPD or emphysema)
- mental health condition (including depression or anxiety)
- stroke, and
- any other long-term health condition(s).

We calculated the per cent of usual residents with at least one long-term condition, as of 2021. Surprisingly, the relationship with this percentage and the IRSEO was negative (correlation coefficient of -0.5725), meaning that those IAREs with a relatively disadvantaged Aboriginal and Torres Strait Islander population had a lower per cent of the Aboriginal and Torres Strait Islander population reporting at least one long-term health condition.

The presence of a long-term condition is highly correlated with age, which may also be related to socioeconomic disadvantage. In order to test for the impact of this age-effect on the relationship with IRSEO, we age standardised to the total Australia population using five age cohorts: 0–14 years; 15–34 years; 35–54 years; and 55 years or older. The correlation between the IRSEO and the age standardised per cent of the IARE with a long-term condition is of slightly lower magnitude (-0.5288), but is still highly negative. However, when we correlate the age standardised per cent of the non-Indigenous population with a long-term health condition and the non-Indigenous value for the PINIRSEO, we find a strong positive correlation as expected (0.6878). In other

words, Indigenous people in more advantaged areas report worse health outcomes, while non-Indigenous Australians in more advantaged areas report better health outcomes.

This was unexpected given the well-known relationship between socioeconomic status and health. To further test the validity of the Indigenous responses to the long-term health condition questions in the 2021 Census, we compared our age-standardised measure of health conditions against an objective measure of health: premature mortality rates. Mortality is an imperfect indicator of population health, particularly because of potential delays between health improvements and decreased death rates. However, it is still an important measure of the health of a population because of its serious nature and objective status.

We sourced annualised, average age-standardised Indigenous premature mortality rates per 100 000 for Indigenous Areas from the *Aboriginal and Torres Strait Islander social health atlas of Australia* (Public Health Information Development Unit, 2023). This measure reports on the rate at which people aged 0–74 die each year. Higher numbers mean a greater mortality rate, something which we would expect to be correlated with the prevalence of long-term health conditions. Indigenous areas in Tasmania and Victoria are excluded from this analysis as suitable mortality data were unavailable.

Figure 8 shows a negative relationship between the 2021 Census-reported rate of long-term health conditions and the mortality rate for the Indigenous population in Indigenous areas. In other words, in areas where Indigenous people live longer, Indigenous respondents to the Census are more likely to report having a long-term health condition. This is puzzling.

This could be a result of comparing self-reported Census data from 2021 with registration data from a different time period (2016–2020). Accordingly, we test this idea by comparing premature mortality rates with IRSEO. Figure 9 shows the relationship between the IRSEO index and the same measure of Indigenous premature mortality. It shows a positive correlation, meaning that in areas where Indigenous people are more advantaged on the IRSEO index, they live longer lives according to death registration data. This relationship is as expected.

Similar counter-intuitive findings where the spatial patterns of self-reported health status for Indigenous people is inconsistent with the spatial patterns of Indigenous mortality have been reported previously (Sibthorpe et al., 2001). There are several potential complementary explanations for this result. First, this may reflect a failure on the part of health services to diagnose, follow-up or treat health conditions among Indigenous patients. It is possible that in areas where health care services are less likely to diagnose Indigenous patients with a long-term health condition, the greater the degree of census under-reporting becomes. According to Anderson and Sibthorpe (1996, p. 125), in such circumstances ‘higher levels of self-reporting may actually imply better existing levels of service provision’. Second, in more disadvantaged areas, health professionals may be less likely to communicate the nature of diagnoses to Indigenous patients in such a way that the patient is able to name their long-term health condition. Third, there may also be an element of selective survival bias (Delgado-Rodríguez & Llorca, 2004), whereby those Indigenous people with higher levels of socioeconomic status are more likely to maintain a relatively long life with one of the long-term conditions covered in the census have than those at lower socioeconomic status.

More work needs to be done to understand the spatial patterns of Indigenous self-reported long-term health conditions in the 2021 Census, and to go beyond these speculations. One fruitful avenue may be to look at the conditions listed in the census data individually, as they do not all show identical inverse relationships to socioeconomic outcomes. It is possible that the explanation for these patterns is different for each health condition, and that the measure of ‘at least one reported long-term health condition’ that we have used is the complex, cumulative outcome.

For now, these analyses suggest that extreme caution is required when interpreting the long-term conditions census measure for Aboriginal and Torres Strait Islander populations. Not only may there be substantial undercounting of conditions, but this undercounting appears to be greater in areas where people are dying younger (according to mortality rates) and more socioeconomically disadvantaged. Accordingly, responses to the 2021 Census question about long-term health conditions are not included in the IRSEO index.

Figure 8 The relationship between the prevalence of long-term health conditions reported in the 2021 Census for Indigenous people, and the average annual premature mortality rate, 2016–2020, Indigenous Areas, excluding Tasmania and Victoria

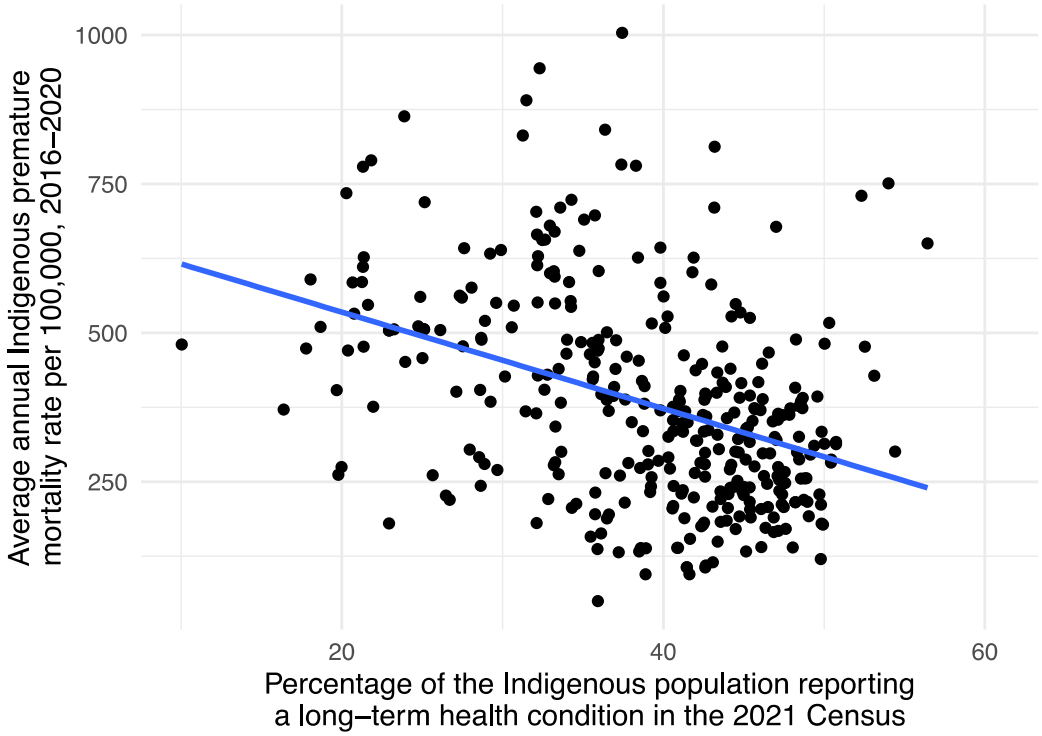
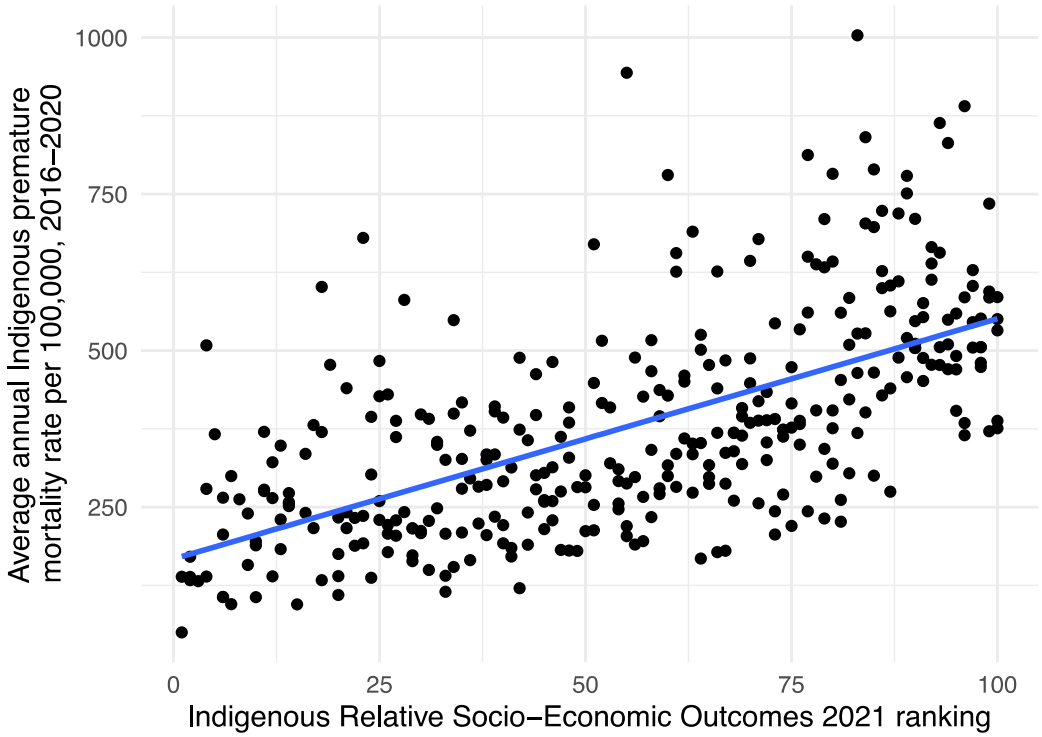


Figure 9 The relationship between the IRSEO 2021 index percentile, and the average annual premature mortality rate, 2016–2020, Indigenous Areas, excluding Tasmania and Victoria



Conclusions and implications for policy

The aim of this paper was to summarise the methodology and results from the estimation of and Indigenous Relative Socioeconomic Outcomes (IRSEO) index for 2021, as well as a Pooled Indigenous and non-Indigenous Relative Socioeconomic Outcomes (PINIRSEO) index for all Indigenous Areas in Australia with an adult sample of 100 or more relevant respondents. This extends the time series from 2001 using a very similar methodology, but updated with the contemporary geographic structure and newly available data.

The key conclusions from earlier indices still hold in that Aboriginal and Torres Strait Islander Australians living in remote areas tend to have worse socioeconomic outcomes than those living in non-remote areas, but there are a number of highly disadvantaged urban areas; and in every area in Australia, the Indigenous population has worse outcomes on average than the non-Indigenous population, with the gaps largest in remote areas. We also show that while the Indigenous-specific index correlates with the recently created 2021 SEIFA for the total population, there are a number of areas that have quite different rankings on the two indices. This highlights the ongoing need for an Indigenous-specific index for use in Indigenous public policy and research.

Some changes to the geography of Indigenous socioeconomic outcomes are apparent in the analysis presented in this paper. First, inequalities in socioeconomic outcomes between Indigenous areas increased between 2016 and 2021. Second, this widening inequality appears to have been patterned by both jurisdiction and location type. Specifically, there was a relative improvement of outcomes in Victoria, while outcomes declined substantially in the Northern Territory. In general, regional areas saw the biggest improvement in socioeconomic outcomes, whereas remote towns and Indigenous towns experienced the greatest relative decline. The geographically uneven government restrictions which were felt most heavily in urban areas appear to be implicated in the relative improvement in outcomes in regional areas. A third and somewhat surprising finding

was that improvement in outcomes was greater for those areas experiencing less rapid unexplained population growth over the last inter-censal period. Fourth, there was some small convergence in outcomes between Indigenous and non-Indigenous Australians. Fifth, we also showed that a health measure newly collected in the 2021 Census does not correlate in the way that we might have expected with an objective measure of Indigenous health (premature mortality) or the index of socioeconomic outcomes for the Aboriginal and Torres Strait Islander population, though it does have the expected correlation with the index created for the non-Indigenous population.

The results are consistent with the well understood patterns of Indigenous relative socioeconomic advantage and disadvantage in Australia. Further research could usefully investigate the extent to which policy changes are driving the relative improvement in outcomes in Victoria, and the relative decline in outcomes in the Northern Territory. The relatively positive outcomes in regional areas warrant further investigation to understand their characteristics and causes.

The widening gap in socioeconomic outcomes between the most disadvantaged areas and the rest is of policy concern. It should be urgently investigated. In particular, we showed that in terms of employment at least, this represents an absolute decline in outcomes rather than just a failure to keep up with improving socioeconomic outcomes in other areas. The drivers of this widening inequality are of immediate and important policy and research interest. The diversity of Indigenous circumstances, always a truism of Indigenous social science, appears to be increasing, at least when it comes to socioeconomic outcomes.

A further area of future analysis is understanding the dynamics of Aboriginal and Torres Strait Islander socioeconomic outcomes at the individual-level. We have shown reasonable stability at the area level in the distribution of socioeconomic outcomes. However, these area averages hide substantial diversity for individuals, especially given the statistical and geographical mobility of Indigenous individuals between census years. Availability of linked longitudinal census data, potentially alongside linked administrative data, will be a valuable resource – once available – to provide a more detailed picture than the area-level data can provide alone.

References

Anderson, I. (2021). Closing the Gap: Negotiating Indigenous power and the Council of Australian Governments. In M. Walter, T. Kukutai, A. A. Gonzales, & R. Henry (Eds.), *The Oxford handbook of indigenous sociology*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780197528778.013.13

Anderson, I., & Sibthorpe, B. (1996). The NATSIS and policy and planning in Aboriginal health. In J. C. Altman & J. Taylor (Eds.), *The 1994 National Aboriginal and Torres Strait Islander Survey: Findings and future prospects* (pp. 118–134). Centre for Aboriginal Economic Policy Research, ANU.

Andrews, J., & Markham, F. (2022, July 6). What it means to identify as Indigenous in Australia, and how this might have contributed to the increase in the census. *The Conversation*. http://theconversation.com/what-it-means-to-identify-as-indigenous-in-australia-and-how-this-might-have-contributed-to-the-increase-in-the-census-185954

Anthony, T., & McGrady, L. (2022). Pandemic policy, First Nations, and the power of self-determination. In N. D. Spence & F. Sekercioglu (Eds.), *Indigenous health and well-being in the COVID-19 pandemic*. Routledge.

Australian Broadcasting Corporation (ABC) (2020, March 20). *Indigenous leaders warn 'if coronavirus gets into our communities, we are gone'* [Text]. https://www.abc.net.au/news/2020-03-20/dire-warning-on-coronavirus-for-indigenous-communities/12076420

Australian Bureau of Statistics (ABS) (2021). *Indigenous Structure: Australian Statistical Geography Standard (ASGS) Edition 3* (Reference Period July 2021-June 2026). ABS. https://www.abs.gov.au/statistics/standards/australian-statistical-geography-standard-asgs-edition-3/jul2021-jun2026/indigenous-structure

Australian Bureau of Statistics (ABS) (2022, November 3). *Australia's journey to work*. https://www.abs.gov.au/articles/australias-journey-work

Biddle, N. (2009). *Ranking regions: Revisiting an Index of Relative Indigenous Socioeconomic Outcomes* (CAEPR Working Paper No. 50). Centre for Aboriginal Economic Policy Research, ANU. http://hdl.handle.net/1885/147804

Biddle, N. (2013). *Socioeconomic outcomes* (2011 Census Papers 13). Centre for Aboriginal Economic Policy Research, ANU. http://hdl.handle.net/1885/119287

Biddle, N., & Markham, F. (2017, December 22). Area Level Socioecononomic Outcomes for Aboriginal and Torres Strait Islander Australians, 2016. *Austaxpolicy: The Tax and Transfer Policy Blog*. https://perma.cc/2JZA-K27J

Coalition of Aboriginal and Torres Strait Islander Peak Organisations (CATSIPO) & Australian Governments (2020). *National Agreement on Closing the Gap* (p. 47). National Indigenous Australians Agency. http://web.archive.org/web/20200926040101/https://www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf

Delgado-Rodríguez, M., & Llorca, J. (2004). Bias. *Journal of Epidemiology & Community Health*, 58(8), 635–641. https://doi.org/10.1136/jech.2003.008466

Dillon, M. (2021). *The new policy architecture for Closing the Gap: Innovation and regression* (CAEPR Discussion Paper No. 299). Centre for Aboriginal Economic Policy Research, ANU. https://doi.org/10.25911/XY0B-5B56

Dinku, Y., Hunter, B., & Markham, F. (2020). How might COVID-19 affect the Indigenous labour market? *Australian Journal of Labour Economics*, 23(2), 189–209.

Edwards, B., Barnes, R., Rehill, P., Ellen, L., Zhong, F., Killigrew, A., Gonzalez, R., Sheard, E., Zhu, R., & Philips, T. (2022). *Variation in policy response to COVID-19 across Australian states and territories: Version 1.0* (Blavatnik School of Government Working Paper BSG-WP-2022/046). Blavatnik School of Government, Oxford University. https://www.bsg.ox.ac.uk/sites/default/files/2022-06/BSG-WP-2022-046_1.pdf

Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., & Tatlow, H. (2021). A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nature Human Behaviour*, 5(4), Article 4. https://doi.org/10.1038/s41562-021-01079-8

Harding, S., Liddle, L., McDonald, P., Morrison, P., Trewin, D., & Walters, S. (2021). *Report on the quality of 2021 Census data: Statistical Independent Assurance Panel to the Australian Statistician*. Australian Bureau of Statistics. https://www.abs.gov.au/census/about-census/census-statistical-independent-assurance-panel-report

Johnston, R. J. (1971). Some limitations of factorial ecologies and social area analysis. *Economic Geography*, 47, 314. https://doi.org/10.2307/143213

Jolliffe, I. T., & Cadima, J. (2016). Principal component analysis: A review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 374(2065), 20150202. https://doi.org/10.1098/rsta.2015.0202

Kennedy, B., & Firman, D. (2004, September 15). *Indigenous SEIFA—revealing the ecological fallacy*. 12th Biennial Conference of the Australian Population Association, Canberra.

Langton, M., & Mazel, O. (2008). Poverty in the midst of plenty: Aboriginal people, the 'resource curse' and Australia's mining boom. *Journal of Energy & Natural Resources Law*, 26(1), 31–65. https://doi.org/10.1080/02646811.2008.11435177

Markham, F., Smith, D., & Morphy, F. (2020). *Indigenous Australians and the COVID-19 crisis: Perspectives on public policy* (CAEPR Topical Issue 1/2020). Centre for Aboriginal Economic Policy Research, ANU. https://doi.org/10.25911/5e8702ec1fba2

Public Health Information Development Unit (2023). *Aboriginal and Torres Strait Islander social health atlas of Australia: Data by Indigenous Area (2021 ASGS)*. Torrens University Australia. https://phidu.torrens.edu.au/social-health-atlases/maps/#aboriginal-torres-strait-islander-social-health-atlas-of-australia

Sibthorpe, B., Anderson, I., & Cunningham, J. (2001). Self-assessed health among Indigenous Australians: How valid is a global question? *American Journal of Public Health*, 91(10), 1660–1663. https://doi.org/10.2105/AJPH.91.10.1660

Slater, T. (2013). Your life chances affect where you live: A critique of the 'cottage industry' of neighbourhood effects research. *International Journal of Urban and Regional Research*, 37(2), 367–387. https://doi.org/10.1111/j.1468-2427.2013.01215.x

Walter, M. (2016). Data politics and Indigenous representation in Australian statistics. In T. Kukutai & J. Taylor (Eds.), *Indigenous Data Sovereignty*. ANU Press. https://doi.org/10.22459/CAEPR38.11.2016.05

Appendix: Additional tables

Table A1 Principal Components Values for IRSEO in 2016 and 2021

Variables	2016	2021
Population 15 years and over employed	0.3657	0.3621
Population 15 years and over employed as a manager or professional	0.3004	0.3052
Population 15 years and over employed full-time in the private sector	0.3391	0.3492
Population 15 years and over who have completed Year 12	0.3247	0.3209
Population 15 years and over who have completed a qualification	0.3606	0.3592
Population 15 to 24 years old attending an educational institution	0.3351	0.3176
Population who live in a house that is owned or being purchased	0.3407	0.3419
Population who live in a household with income above half the median	0.2936	0.3131
Population who live in a household not identified as overcrowded	0.3333	0.3256

Table A2 A comparison of variables included in IRSEO 2021 and SEIFA IRSAD 2021

SEIFA IRSAD 2021	IRSEO 2021
Per cent of people aged 15 years and over whose highest level of education is Year 11 or lower. Includes Certificate I and II	Per cent of Indigenous population 15 years and over who have completed Year 12
Per cent of people living in households with stated annual household equivalised income between $1 and $25 999 (approx. 1st and 2nd deciles)	Per cent of Indigenous people who live in a household with equivalised income above half the Australian median
Per cent of employed people classified as 'labourers'	
Per cent of people aged under 70 who need assistance with core activities due to a long-term health condition, disability or old age	
Per cent of families with children under 15 years of age who live with jobless parents	
Per cent of employed people classified as Machinery Operators and Drivers	
Per cent of occupied private dwellings paying rent less than $250 per week (excluding $0 per week)	
Per cent of people aged 15 and over who are separated or divorced	
Per cent of one parent families with dependent offspring only	
Per cent of people (in the labour force) unemployed	Per cent of Indigenous people aged 15 years and over employed

Per cent of employed people classified as Low Skill Community and Personal Service Workers	
Per cent of people aged 15 years and over whose highest level of educational attainment is a certificate III or IV qualification	Per cent of Indigenous people aged 15 years and over who have completed a post-school qualification
Per cent of occupied private dwellings requiring one or more extra bedrooms (based on Canadian National Occupancy Standard)	Per cent of persons living in a dwelling that requires one or more extra bedrooms (based on Canadian National Occupancy Standard)
Per cent of people aged 15 years and over who have no educational attainment	
Per cent of employed people classified as Low Skill Sales	
Per cent of people aged 15 years and over at university or other tertiary institution	Per cent of Indigenous people aged 15 to 24 years old attending an educational institution
Per cent of occupied private dwellings with four or more bedrooms	
Per cent of people aged 15 years and over whose highest level of education attainment is a diploma qualification	
Per cent of occupied private dwellings paying rent greater than $470 per week	
Per cent of employed people classified as Managers	Per cent of Indigenous people aged 15 years and over employed as a manager or professional
Per cent of occupied private dwellings paying mortgage greater than $2800 per month	Per cent of Indigenous people who live in a house that is owned or being purchased
Per cent of employed people classified as Professionals	
Per cent of people living in households with stated annual household equivalised income greater than $91 000 (approx 9th and 10th deciles)	

CONTACT US

Centre for Aboriginal Economic Policy Research
Research School of Social Sciences
ANU College of Arts & Social Sciences

Copland Building #24
The Australian National University
Canberra ACT 0200
Australia

T +61 2 6125 0587
W caepr.cass.anu.edu.au

ANU CRICOS Provider Number: 00120C